

# A systematic review and thematic synthesis exploring how a previous experience of physically activity influences engagement with cardiac rehabilitation

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# Abstract

## Background

Exercise-based cardiac rehabilitation is recognised internationally as an effective therapy to improve quality of life and reduce risk of hospital readmission for individuals diagnosed with Acute Coronary Syndrome. Despite this, half of eligible individuals choose not to engage and the main reason is lack of interest.

Furthermore, prior to attending, forty percent of eligible individuals report meeting physical activity guidelines. It is unclear whether this influences decisions about engagement.

## Aims:

The aim of this review is to systematically examine qualitative evidence describing patient's perceptions and experiences, and synthesise what is known about how a previous experience of physical activity in adults diagnosed with Acute Coronary Syndrome influences engagement with physical activity during cardiac rehabilitation.

## Methods:

A systematic review and thematic synthesis of primary qualitative studies to examine peer-reviewed literature published between 1990 and 2017, accessed from database searches of MEDLINE, CINAHL, PsycINFO and Embase.

## Results

The initial search produced 486 studies, and of these, twelve relevant studies were included in this review. Studies included 388 participants from six countries. For previously active individuals, communication factors, self-perceptions of an exercise

identity and experience of cardiac rehabilitation influence engagement in physical activity during cardiac rehabilitation.

## Conclusion

In adults diagnosed with acute coronary syndrome, communication post-event and during cardiac rehabilitation is a source for self-appraisal and creates expectations of cardiac rehabilitation. Additionally, perceptions of an exercise identify and experience of exercise-based cardiac rehabilitation influence decisions about engagement. To improve uptake and adherence, health professionals should consider previous physical activity levels and tailor information to optimise physical activity post-event.

## Key words

Cardiac rehabilitation, acute coronary syndrome, physical activity, previous experience, engagement, self-perceptions

## Introduction

Coronary heart disease (CHD), which frequently presents as acute coronary syndrome (ACS), contributes to more than 17 million global deaths per annum.<sup>1</sup> Survivors of ACS are twice as likely to have a cardiac event compared to people with no history of CHD.<sup>2</sup> Therefore, preventing recurrence is a priority focus of international population approaches.<sup>3</sup> Globally, cardiac rehabilitation (CR) is recognised as a cost-effective programme, which helps participants reduce cardiovascular risk factors, improve quality of life, and reduces hospital readmission and mortality.<sup>4</sup>

Exercise is a central component of CR<sup>5</sup> and a sub category of physical activity (PA).<sup>6</sup> Exercise is defined as activity that is planned, structured, repetitive and done for a specific reason, whereas PA is defined as any bodily movement produced by skeletal muscle that requires energy expenditure.<sup>6</sup> CR guidance for PA is in line with national guidelines and individuals diagnosed with ACS are recommended to achieve a minimum of 150 minutes per week of moderate intensity exercise,<sup>5</sup> for example, brisk walking and cycling at 3-6 Metabolic Equivalent for Tasks (METs), or 75 minutes per week of vigorous intensity exercise, for example, running or swimming at >6 METs.<sup>7</sup> Exercise performed regularly as prescribed by exercise-based CR is positively associated with improvements in secondary prevention outcomes and quality of life.<sup>8, 9</sup>

The goal of exercise-based CR is to support participants establishing a regular exercise routine and the dose response relationship between the exercise amount and the risk of a secondary event is central.<sup>10</sup> Furthermore, current standards for CR recommend exercise is tailored towards the participant's current exercise

behaviour.<sup>11</sup> The process of stratifying the risk of a further event during exercise prior to embarking on a structured exercise regime ensures the prescribed intensity of a CR programme is low risk for participants post cardiac event.<sup>12</sup>

Despite the substantial benefits of exercise-based CR, contemporary research highlights programme factors that undermine the efficacy of CR.<sup>13</sup> Across Europe, over 42% of CR programmes perceived they had insufficient capacity to meet demand, reporting insufficient staffing to be a major issue.<sup>13</sup> In the United Kingdom (UK), 49% of eligible individuals choose not access CR services, and the most common reason reported is a lack of interest (31%).<sup>8</sup> Of those who do attend, 30% will drop-out.<sup>8</sup> Furthermore, 45% of programmes do not meet the national target of starting patients within 33 days of their cardiac event.<sup>8</sup> During this time delay, patients may return to their regular daily activities. A review including 26 randomised control trials (n=9239), investigating the effects of CR to alter daily PA habits after a diagnosis of ACS, confirms centre-based CR is insufficient to affect improvement, or maintenance, of an active lifestyle.<sup>14</sup> The findings of Ter Hoeve et al. (2015) suggest CR programmes have varied protocols, resulting in an inability to understand what CR elements impact PA. Understanding these components is essential to improve interventions aimed at addressing PA habits.<sup>14</sup>

Several factors influence an individual's engagement with exercise and PA. These are socioeconomic characteristics, opportunities/constraints and individual attitudes, preferences, motivation, and skills.<sup>15</sup> Further influences relate to psychological correlates of the 'self', for example, the meanings a person attributes to themselves within a situation.<sup>16</sup> These personal constructs influence individual exercise and PA decisions, contributing to an exercise identity. An individual's level of PA prior to a cardiac event is likely to be an important factor, but to date, has received little

attention in the research literature. Up to 40% of eligible patients report already achieving the recommended level of PA prior to starting exercise-based CR;<sup>8</sup> however, it is unclear how this influences engagement with CR services. Qualitative findings from a systematic review (n=1213), confirm individual barriers affecting attendance include beliefs related to PA, for example, believing themselves to be already active.<sup>17</sup> Therefore, the aim of this review is to systematically examine qualitative evidence describing patient's perceptions and experiences, and synthesise what is known about how a previous experience of PA in adults diagnosed with ACS influences engagement with PA during CR.

## Methods

The study incorporated a systematic review protocol to identify empirical evidence.<sup>18</sup> This has then been thematically synthesised<sup>19</sup> to explore how being previously active influences engagement with CR. The systematic review protocol followed the ENTREQ framework for reporting and synthesising qualitative research.<sup>20</sup> The review was pre-registered with PROSPERO (no.CRD42018096573).

### Systematic review protocol

The review comprehensively searched peer-reviewed literature accessed from database searches of MEDLINE, CINAHL, PsycINFO and Embase using a pre-piloted search strategy to identify relevant qualitative evidence published in English between January 1990 and December 2017. This time period represents the introduction of exercise-based CR to recent clinical guidelines, advocating a move from traditional to individualised models of delivery.<sup>5</sup> To support the robust approach to the search strategy, crosschecking with supplementary methods, such as reference lists, citation tracking and hand searching was also completed. With

input from an information technician, the following search terms and key words were modified to suit each database, 'acute coronary syndrome', 'myocardial revascularisation', 'heart diseases', 'rehabilitation', 'exercise', 'exercise therapy', 'qualitative studies', 'grounded theory', 'focus groups', 'interviews', 'narration'. Inclusion criteria stipulated all primary research related to adults diagnosed with ACS aged 18 years or older, eligible to attend CR, and excluded all letters, commentaries, reviews and discussion papers.

### Quality appraisal

The consolidated criteria for reporting qualitative research (COREQ),<sup>21</sup> was used to evaluate included studies; this 32 item checklist was designed to promote the explicit and comprehensive reporting of qualitative studies addressing domains that align with trustworthiness in qualitative research studies, such as reflexivity.<sup>21</sup> One reviewer (SMcH) evaluated each study against COREQ items. To support the robustness of this process a sample of three studies were evaluated by a second reviewer (CH) and comparisons found to be similar.

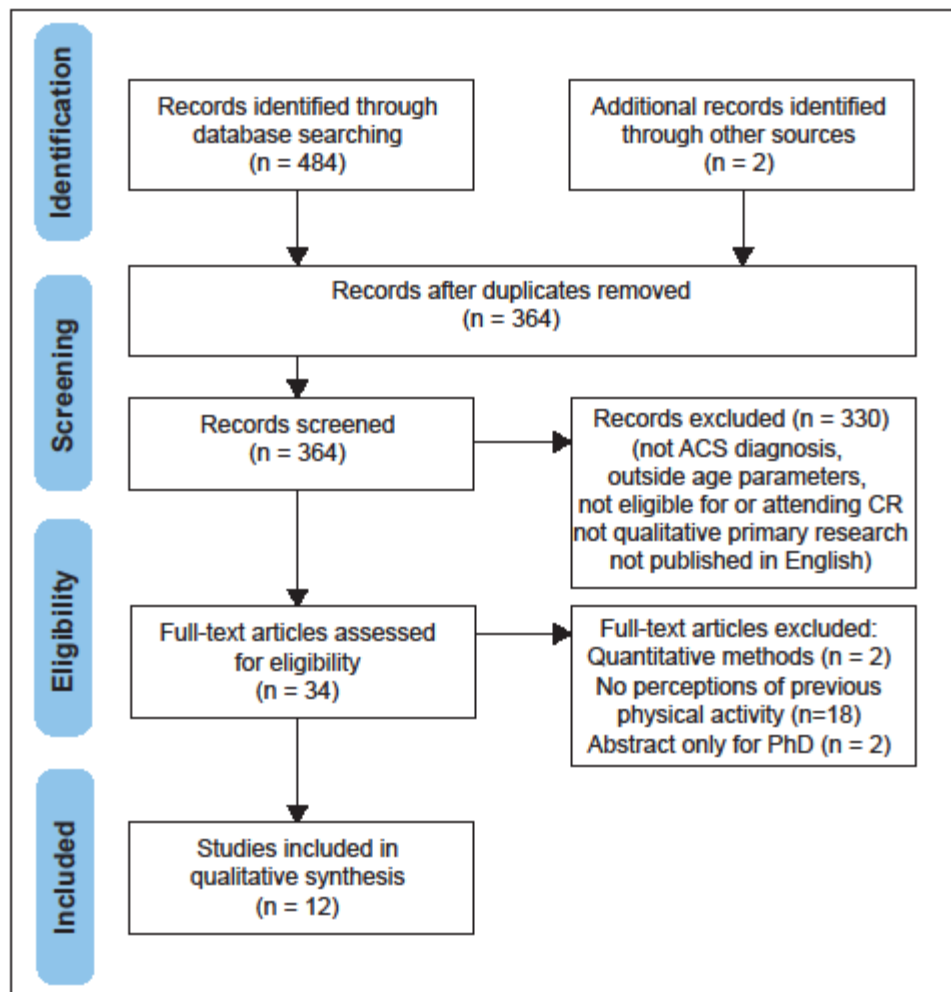
### Study selection

From 486 search results, two reviewers, (SMcH & CH) independently screened titles and abstracts (Figure 1). After applying the selection criteria and including only papers where participants were exposed to CR or secondary prevention advice, full texts were obtained for 34 papers. The articles were crosschecked to ensure there were themes or categories that provided data on participant views, experiences and perceptions of PA, fitness, exercise or exertion. Any disagreements were recorded and a consensus reached through discussion. Twelve qualitative papers met the criteria for inclusion.

**Figure 1. PRISMA diagram: Flow of studies included in the systematic review.<sup>22</sup>**



Figure 1 PRISMA diagram: Flow of studies included in the systematic review



## Synthesis methodology

To generate new insights from the primary studies, the thematic synthesis methodology by Thomas and Harden (2008)<sup>19</sup> was selected because it provides an explicit and transparent process to reducing qualitative data with varying reporting styles, including thin description and multiple quotations. This approach to data synthesis has three stages: Free line-by-line coding, organisation of 'free codes' to construct 'descriptive' themes and the development of 'analytical' themes.<sup>19</sup>

One reviewer (SMcH) coded each line of verbatim text labelled 'results' or 'findings' within the twelve studies. The text included participant quotations, themes, sub-themes and findings of the original authors. Remaining close to the original text, free codes were created inductively to form a bank of codes and further systematically organised into descriptive themes. The descriptive themes were re-interpreted inductively, developing analytical themes to answer the review question. To support the robustness of the analytical approach two reviewers, (SMcH & CH), crosschecked themes in relation to the review question.

## Results of systematic review

### Study characteristics

Twelve international studies from Canada (n=2), USA (n=1), Sweden (n=1) and the UK (n=8), represent 388 participants (female n=118, males n=270), age range 56 to 73 years, who were diagnosed with ACS (n=3), MI (n=7), and participants post MI and coronary artery bypass surgery (CABG) (n=1), and Type 2 diabetes (n=1) (Table 1).

<b>Table 1. Summary of included qualitative papers and participant characteris ticsAuthor /Year/ Country</b>	<b>Title</b>	<b>Research question /Aim</b>	<b>Source of participants</b>	<b>Participants (Including number)</b>	<b>Sex (n)</b>	<b>Method</b>	<b>Results</b>
Back et. al. (2017) Sweden	Important aspects in relation to patients' attendance at exercise-based cardiac rehabilitation - facilitators, barriers and physiotherapist's role: a qualitative study	To explore aspects that influence patients' attendance at exercise-based CR after acute CAD and the role of the physiotherapist in patients' attendance	Both at inpatient CCU phase 1 and at CR programme phase II	STEMI, NSTEMI, unstable angina, PCI (n=16) mean age 64.5 yrs.	M(11) F (5)	Content analysis	The results of the analysis identify four main categories influencing the patients' ability or will to attend exercise-based CR. (i) The patients' previous experience of exercise influenced attitudes to exercise during exercise-based CR. (ii) How well the CR staff during the acute phase met the patients' needs in relation to exercise-based CR. (iii) Important prerequisites for attending exercise-based CR include the physiotherapists role, patients' self-image, self-efficacy and practical factors. (iv) The patients' future ambitions with regard to exercise. Increased awareness of mortality and fear related to exercise influence attendance at exercise-based CR.
Clark et. al. (2004) Scotland	Promoting participation in cardiac rehabilitation: patient choices and experience	To compare decision making in relation to cardiac rehabilitation attendance in users, non-users and patients with high attrition rates	CR programme	MI, CABG (n = 44) 66 yrs.	M(33) F(11)	Framework method of analysis	Participants reported beliefs that influenced attendance decisions related to self, CHD, CR, other attending patients and health professionals' knowledge. Embarrassment about group or public exercise negatively influenced attendance. Those who attended reported increased faith in their bodies, a heightened sense of fitness and a willingness to support new patients who attended

Cleary et. al. (2015) USA	Perceptions of exercise and quality of life in older patients in the United States during the first year following coronary artery bypass surgery	To describe factors that influenced adherence to exercise, and perceptions of activity limitations and health-related quality of life	Phase 1 CR inpatient	MI, CABG (n=28) mean age 73 yrs.	M(23) F(5)	Descriptive content analysis	Influences varied across time points. Motivators included that it felt good to exercise and the belief that exercise improves physical health. Barriers to exercise included time, weather and pain/injury/illness.
Cooper et. al. (2005) England	A qualitative study investigating patients' beliefs about cardiac rehabilitation	To elicit patients' beliefs about the role of the cardiac rehabilitation course following myocardial infarction	Phase 1 CR	AMI (n=13) mean age 56 yrs.	M(9) F(4)	Phenomenology IPA	Beliefs about course content, perceptions of exercise, the benefits of CR and CR knowledge influenced attendance decisions. Some viewed CR as important to recovery, others misunderstood the role of exercise. Cardiac misconceptions were present and negatively influenced attendance.
Dale et. al. (2015) Canada	"I'm No Superman": Understanding Diabetic Men, Masculinity, and Cardiac Rehabilitation	The research question is unclear. This papers reports findings from study of gender and co-morbidity in male CR participants	CR	CHD and Type 2 Diabetic (n=16) mean age 66 yrs.	M(16)	Ethnography	Men assumed two positions to regain a sense of competency lost in illness: (a) working with the experts and (b) rejection of biomedical knowledge. The findings emphasize the priority given by the participants to the rehabilitation of a positive masculine identity.
Galdas et. al. (2012) Canada	Punjabi Sikh patients' perceived barriers to engaging in physical exercise following myocardial infarction	To explore the perceived barriers to engaging in physical activity among Canadian Punjabi Sikh individuals who have suffered an MI	CR programme	MI within past 6 months (n=15) mean age 65.6 yrs.	M(10) F(5)	Phenomenology	Perceived barriers to engagement in physical activity included difficulty in determining safe exertion levels independently; fatigue and weakness; preference for informal exercise; and migration related challenges.

Herber et. al. (2017) Scotland	Just not for me' - contributing factors to nonattendance/ non-completion at phase III cardiac rehabilitation in acute coronary syndrome patients: a qualitative enquiry	To explore what reasons non-attenders and non-completers give for their patterns of participation or non-participation in cardiac rehab and how future uptake could be enhanced	post phase III CR	ACS (n=25) mean age 62 yrs.	M(18) F(7)	mixed methods - thematic analysis	Major influences on participation were reported to be personal factors, programme factors and practical factors. Significant barriers to CR attendance were that participants perceived themselves unsuitable and lack of knowledge and/or misconceptions about CR.
Hird et. al. (2004) Scotland	Getting back to normal': Patients' expectations of cardiac rehabilitation	To determine patients' expectations of cardiac rehabilitation and how these might influence participation in cardiac rehabilitation programmes	Cardiac care unit - inpatient	CABG & valve surgery (n= 50) (M) 63 yrs. (F) 62 yrs.	M(34) F (16)	Descriptive study, Framework analysis	Many patients associated CR with recovery and exercise. The majority of patients reported receiving information about CR and half of patients were positive about attending CR with the most important factor being the exercise component. Barriers to CR include difficulty with transport and family commitments.
Jones et. al. (2007) England	DNA' may not mean 'did not participate': a qualitative study of reasons for non-adherence at home and centre-based cardiac rehabilitation	To explore patients' reasons for non-participation in or non-adherence at home and centre-based cardiac rehabilitation	BRUM trial – CR programme	MI, PTCA or CABG (n=49) mean age 62 & 63 yrs.	M(33) F(16)	The framework method	Reasons given for non-attendance and non-completion of CR were that patients participated in alternative exercise activities and other health problems prevented participants from exercising as much as they had expected. Non-adherers found some aspects of CR helpful and had made lifestyle changes. Lack of motivation to attend CR was the main reason for non-adherence in home programme, particularly for females.

McCorry et. al. (2009) Northern Ireland	Perceptions of exercise among people who have not attended cardiac rehabilitation following myocardial infarction	To explore in detail patients' beliefs about exercise for promoting recovery from MI within the context of cardiac rehabilitation among men and women who did not attend formal CR programme	GP practice	MI (n=14) mean age 64 yrs.	M(8) F (6)	Constant comparative analysis	Participants did not recognise the cardiovascular benefits of exercise, and perceived keeping fit through daily activities as sufficient for health. Health professionals were perceived to downplay importance of exercise and CR, with medication viewed as more important for health than exercise.
Robertson et. al. (2010) England	Embodied masculinities in the context of cardiac rehabilitation	To explore men's experiences of their embodied selves in the context of a cardiac rehabilitation programme?	CR	MI mentioned in data (n=34) 48-84 yrs.	M(34)	Secondary analysis - retrospective interpretation	The analysis generated four overarching themes as follows: Embodied emotionality includes men's expression of emotions related to their body. Renegotiated embodiment includes reference to the men's thoughts and feelings of their body prior to their cardiac event when compared to after their cardiac event. Embodiment and fitness refers to the renegotiation of the male identity and knowing the hidden body refers to an improved awareness of signals from within the body.
Shaw et. al. (2012) Scotland	Pre-exercise screening and health coaching in CHD secondary prevention: a qualitative study of the patient experience	Patients' attitudes towards and experience of a lifestyle intervention (specifically around exercise behaviour)	Primary care CVD secondary prevention clinic at 1 year follow up	MI, Angina, CHD, PCI (n=84) mean age 69.9 yrs.	M(41) F (43)	No theoretical framework reported – constant comparative analysis	The majority of patients were positive about CR referral. Patient barriers to attending and completing included belief that they were sufficiently active already, the existence of other health problems, feeling unsupported in the CR exercise class and competing demands.
Legend =      CCU = Coronary Care Unit      NSTEMI = non-ST elevation myocardial infarction      PCI = Percutaneous coronary intervention STEMI = ST elevation myocardial infarction      MI = myocardial infarction      PTCA = Percutaneous transluminal coronary angioplasty AMI = Acute myocardial infarction      CABG = Coronary artery bypass graft CAD = Coronary artery disease      CVD = Coronary vascular disease							

## Quality appraisal

All studies had relevant ethical approvals. The comprehensiveness of reporting varied across the studies, with the number of criteria fulfilled ranging from 13-24 (Table 2). Items most frequently reported related to trustworthiness in study design and reporting of findings. Items less likely to be reported concerned transparency about the research team and relationship with participants. Papers were not excluded based on the quality.<sup>21</sup>

**Table 2. Comprehensiveness of reporting across included studies as assessed using the consolidated criteria for reporting qualitative research (COREQ).**

Studies	Back et. al. (2017)	Clark et. al. (2004)	Cleary et. al. (2015)	Cooper et. al. (2005)	Dale et. al. (2015)	Galdas et. al. (2012)	Herber et. al. (2017)	Hird et. al. (2004)	Jones et. al. (2007)	McCorry et. al. (2009)	Robertson et. al. (2010)	Shaw et. al. (2012)
<b>Domain 1: Research team and reflexivity</b>												
<b><i>Personal characteristics</i></b>												
Interviewer/facilitator	x	x		x	x	x		x	x	x		x
Credentials	x	x	x	x	x	x	x		x	x		
Occupation	x	x	x		x		x		x	x		
Gender	x	x	x	x			x			x	x	
Experience & training	x						x			x		x
<b><i>Relationship with participants</i></b>												
Relationship established	x			x		x						
Participant knowledge of the interviewer	x			x		x						x
Interviewer characteristics	x						x			x		
<b>Domain 2: Study design</b>												
<b><i>Theoretical framework</i></b>												
Methodological orientation and Theory	x		x	x	x	x	x			x	x	
Sampling	x	x	x	x	x	x	x	x	x	x	x	x
Method of approach	x	x		x	x	x	x		x	x	x	x
Sample size	x	x	x	x	x	x	x	x	x	x	x	x
Non-participation			x	x					x	x	x	x
<b><i>Setting</i></b>												
Setting of data collection	x	x	x	x	x	x	x	x	x	x	x	x
Presence of non-participants		x							x			

Description of sample	x		x		x	x	x	x	x			x
<b>Data collection</b>												
Interview guide	x	x	x	x		x	x	x		x		x
Repeat interviews	x		x		x			x			x	
Audio/visual recording	x	x	x	x		x	x	x	x	x		x
Field notes									x			
Duration	x	x		x		x	x	x	x		x	x
Data saturation						x	x			x		
Transcripts returned												
<b>Domain 3: Analysis and findings</b>												
<b>Data analysis</b>												
Number of data coders	x	x		x	x		x	x	x	x	x	x
Description of the coding tree	x	x	x	x	x		x		x		x	
Derivation of themes	x	x	x	x	x		x		x	x	x	
Software					x	x						x
Participant checking			x									
<b>Reporting</b>												
Quotations presented	x	x	x	x	x	x	x	x	x	x	x	x
Data and findings consistent	x	x	x	x	x	x	x	x	x	x	x	x
Clarity of major themes	x	x	x	x	x	x	x	x	x	x	x	x
Clarity of minor themes			x	x	x		x					
Legend: X = discussed in publication												

## Results of thematic synthesis

The study found, previously active adults, diagnosed with acute coronary syndrome, were influenced to engage in physical activity during CR by communication factors that involve both their self-perceptions of an exercise identity and their experience of CR.

The overarching communication factors include two subthemes: “post-event communication and advice” and “expectations of exercise-based CR”. Advice given post-event and during CR, provided the context for decisions about engagement with exercise-based CR.

One of the two major themes involved with communication factors, “self-perceptions of an exercise identity”, influenced the perceived need for exercise-based CR.



Exercise identity was formed by the influence of five subthemes: “motivators to exercise”, “self-confidence in physical ability”, “exercise self-reliance”, “perceptions of fitness identity”, and “perceptions of severity of cardiac condition”.

The second major theme involved with communication factors, “experience of exercise-based CR, was formed by the influence of two subthemes: “age appropriateness of CR” and “appropriateness of CR exercise”.

When communication factors, major themes and subthemes are combined, the novel Model of Engagement (Figure 2) is developed. Depending on the interaction of “self-perceptions of an exercise identity” and “experience of exercise-based CR”, three resultant influences on PA have been identified as knowledge of appropriate exercise levels and benefits of CR for secondary prevention, improvements in fitness level and social support for physical activity post-cardiac event.

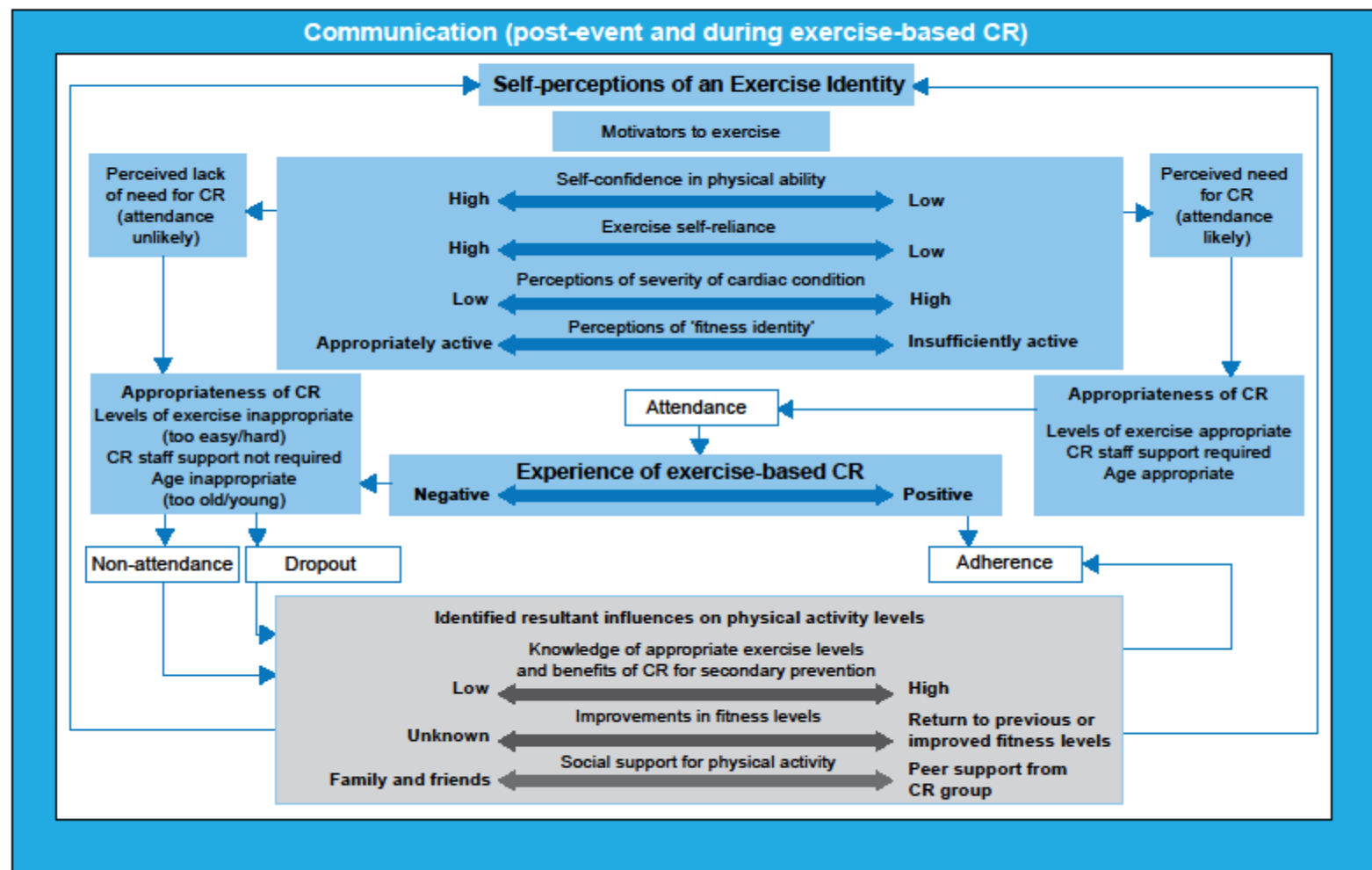
A supplementary table showing indicative quotes for each theme is provided (Supplementary file 1).

## Communication factors

### *Post-event communication and advice*

Post-event communication and advice represented participant reflections about the invitation to attend CR, and the information received from health professionals during the in-patient stay and period after discharge. Post-event communication issues include participants being uncertain about the purpose of CR.<sup>23-25</sup> Where communication meant that participants associated CR primarily with exercise, some felt embarrassment at the idea of group exercise.<sup>23, 25, 26</sup> For a few participants who felt able to exercise independently, this meant attendance was not considered necessary.<sup>23, 24</sup>

Figure 2 Model of engagement in physical activity during cardiac rehabilitation



Communication factors that improved early decision making and encouraged engagement included reinforcement of the benefits of attending exercise-based CR.<sup>26-28</sup> Other communication factors positively contributing to attendance included information about types of exercise-based CR activity and reinforcement of the prospect of a supervised environment.<sup>23, 27</sup> Participants who did not attend suggested improvements to initial communication could include specific detail about the aims and objectives of exercise sessions.<sup>24, 27</sup>

### *Expectations of exercise-based cardiac rehabilitation*

Post-event communication and communication during CR influenced both prospective and reflective expectations of exercise-based CR. Patient expectations included accessing individualised exercise advice, regaining fitness and support with identifying exertion levels.<sup>23-25, 27</sup> For participants post MI, accessing psychological and emotional support in relation to fears about exercise, and trusting staff to be experts in exercise were important factors in engagement decisions.<sup>23, 27, 29</sup>

Where communication created expectations of individualised support, some participants,<sup>27, 29</sup> but not all, experienced this.<sup>29</sup> Non-completers reported expectations being unmet, for example, not receiving individualised monitoring of cardiovascular fitness,<sup>24, 26, 29</sup> goal setting or feedback about progress.<sup>24</sup>

### *Self-perceptions of an exercise identity*

#### *Motivators to exercise*

Motivators to exercise represented influences for re-engaging with previous exercise and attending exercise-based CR. Participants were motivated to return to previous activities,<sup>28, 30</sup> where exercise was part of a previous 'habit',<sup>30</sup> or routine.<sup>27</sup>

Previously active participants identified motivators to exercise including social support from family and friends<sup>28, 30, 31</sup> and goal setting.<sup>27</sup> Participants who were not previously active, lacked motivation to exercise and social support.<sup>30</sup>

A motivator to attend exercise-based CR was determining appropriate exertion levels.<sup>25, 29</sup> During attendance, motivators to exercise included enjoyment, familiar activities, feeling safe during exertion,<sup>27, 31, 32</sup> and believing in the health benefits of exercise, for example, the contribution of exercise towards reducing secondary prevention risks.<sup>26, 27, 33</sup>

### *Self-confidence in physical ability*

Self-confidence in physical ability reflected perceptions of how participants felt about their ability to re-engage with PA after their cardiac event. Those communicating high self-confidence felt able to return to previous PA and did not attend exercise-based CR.<sup>23, 24, 27, 28</sup> Exercise-based CR was rejected if it was perceived that the programme activities were similar to previous activities, resulting in confidence to return to activities independently.<sup>23, 24</sup>

Lack of self-confidence to return to previous exercise intensity levels acted as a facilitator for participants to attend exercise-based CR.<sup>27</sup> Those planning to attend exercise-based CR were seeking to build confidence in their ability to exercise,<sup>23, 25</sup> or support to regain confidence about fitness levels.<sup>23, 25</sup> Participants who were not previously active lacked self-confidence to take part in exercise-based CR.<sup>29</sup> For participants attending CR, even for a limited number of sessions, the exercise component acted as a medium to rebuild exercise self-confidence.<sup>26, 27, 33, 34</sup>

### *Exercise self-reliance*

Exercise self-reliance represented perceived capability to return to previous PA when considering information received from health professionals, or experience of exercise-based CR. Decisions about non-attendance included participants perceiving themselves self-reliant, having resources to support their return to exercise, being knowledgeable about exercise exertion levels,<sup>29</sup> feeling able to reproduce a better exercise programme,<sup>24</sup> having access to gym equipment or memberships,<sup>23, 34</sup> or perceiving themselves fitter than the exercise intensity levels of exercise-based CR.<sup>24, 27</sup> Non-completers perceived themselves fitter than the intensity levels of exercise-based CR.<sup>24, 26, 27</sup>

Increasing the dose of exercise increased self-reliance and remained important throughout attendance<sup>30, 33</sup> with a minority of participants reporting this conflicted with the aims of CR health professionals.<sup>26</sup> Participants completing CR returned to similar, or improved, levels of fitness,<sup>26, 27, 33</sup> and for males post-surgery, an additional benefit included gaining understanding about safe upper limits for exercise intensity. The ability to self-pace was reported as a means of retaining control thereby increasing self-reliance.<sup>33</sup>

### *Perceptions of severity of cardiac condition*

Severity of illness referred to perceptions about the seriousness of illness either before or after the cardiac event and/or surgery.<sup>32, 33</sup> Severity of illness included comparisons with others perceived to be more suited to exercise-based CR.<sup>24, 26, 27</sup> Regardless of age and stage of recovery, perceptions about illness severity were reduced if participants believed that PA had not been limited,<sup>26, 30</sup> or perceived that they could manage their condition, that their heart attack was 'mild',<sup>24, 27, 28</sup> and that

medical management had helped recovery, meaning that exercise-based CR had no value.<sup>28</sup>

In contrast, awareness of mortality and fear of death affected exertion levels, and was suggested to be both a facilitator and barrier to attendance.<sup>23, 26, 27</sup> Non-engagers with exercise-based CR reported self-limiting exercise intensity due to fear, believing cardiovascular risks were negatively associated with exercise exertion.<sup>24, 28,</sup>  
<sup>30</sup> For participants post MI, attending exercise-based CR reduced fear about exertion levels.<sup>27</sup> The existence of co-morbidities was an issue for non-attendance.<sup>34</sup>

### *Perceptions of 'fitness identity'*

Participants perceived they had a 'fitness identity'. They referred to the 'self' to differentiate themselves and their abilities in relation to exercise-based CR, or during comparisons with others for whom they perceived CR was more suited.<sup>24, 26, 27, 32</sup>

Participants not attending, or not completing, CR described themselves as 'not the sporty type',<sup>27</sup> or appraised themselves as 'fit', 'fitter', or more able than others.<sup>24, 26,</sup>

<sup>32</sup>

During the decision making process, a limited number of women perceived CR to include participants who were fitter than themselves.<sup>23</sup> Attenders, including those post-surgery, described themselves as being 'unfit' prior to their cardiac event.<sup>26</sup>

Males with a prior diagnosis of type two diabetes resisted 'diagnostic labels' perceived to be assigned during exercise-based CR, which conflicted with physical self-perceptions of strength and negatively impacted their views of advice, information and solutions offered by CR health professionals.<sup>32</sup> For participants completing exercise-based CR, the fitter self was at the core of their discussions. For one group of males, CR exercise ignited feelings associated with a 'fitter-self' lost

after the cardiac event,<sup>33</sup> whilst others described their reclaimed self as being 'fitter'.<sup>26, 33</sup>

## Experience of exercise-based cardiac rehabilitation

### *Age appropriateness of cardiac rehabilitation*

Regardless of gender, participants compared their own age with the perceived age of others when referring to the appropriateness of CR. Those choosing not to attend exercise-based CR characterised participants who did attend as either older, or younger than themselves.<sup>26-28, 32, 34</sup> Where participants considered themselves outside age norms, negative attitudes towards exercise-based CR were reported.<sup>25, 28, 32, 34</sup>

For younger working age males diagnosed with type 2 diabetes, the age image of exercise-based CR was a reminder of physical losses, resulting in participants choosing not to attend.<sup>32</sup> For others, including those who were older, preferring activities where the physical demands accommodated their age perceptions influenced both adherence and non-adherence to exercise-based CR.<sup>27, 30</sup>

### *Appropriateness of cardiac rehabilitation exercise*

Some participants perceived that CR exercises were inappropriate. Those who perceived themselves to be already active did not attend exercise-based CR, instead believing alternative activities would be appropriate and sufficient when compared to their understanding of exercise-based CR.<sup>24, 28-30, 34</sup> Alternative activities included, walking, gym work, golf, daily chores and gardening.<sup>24, 28, 34</sup> Participants perceived these activities to be less strenuous than exercise-based CR and emphasised that their chosen activity accommodated physical ability,<sup>24, 28</sup> lifestyle,<sup>30, 34</sup> social and cultural beliefs.<sup>31</sup> Preference for these activities was also found in participants who

were not previously active.<sup>27</sup> Additionally, participants who reported having a physically demanding occupation were more likely to not attend or dropout, perceiving further exercise was not appropriate.<sup>27, 32</sup> Participants who dropped out suggested that exercise-based CR should be individualised.<sup>24</sup>

## Discussion

This systematic review provides the first meta-synthesis of qualitative studies to understand how a previous experience of PA, in adults diagnosed with ACS, influences engagement in PA during CR. Decisions about engagement in exercise-based CR were influenced by self-perceptions of an exercise identity and experience of exercise-based CR. Communication and advice given post event and during exercise-based CR provided the context for decisions about engagement. Exercise identity was formed by perceptions about motivators to exercise, exercise self-confidence, self-reliance, illness severity and a 'fitness identity'. It influenced the perceived need for exercise-based CR. For those that attended, CR exercise experiences were important in encouraging or discouraging adherence. Factors influencing adherence include perceptions about age/exercise appropriateness and staff support.

Previous systematic reviews of qualitative evidence have explored individual factors influencing decisions of engagement.<sup>17, 35</sup> Individual barriers include misunderstandings about the purpose of CR and patients believing themselves to be already active.<sup>17</sup> This review supports the need to clarify the multidisciplinary nature of CR, given that some participants perceived it to be primarily an exercise intervention,<sup>23-26</sup> and adds to the findings of past reviews, by exploring why previous



exercise experience is an important factor influencing decisions about CR engagement.

This review supports previous findings, confirming self-perceptions of identity influence decisions about engagement in exercise services<sup>35, 36</sup> and although exercise programmes are a source for social comparisons,<sup>35</sup> this synthesis confirms CR communication provides a source for self-reflection. CR communication contributes to the formation of self-perceptions of physical and psychological ability, which are influenced by previous PA levels. Individuals are motivated to return to their previous exercise behaviour and perceptions related to the severity of their illness influence their ability to resume such activities.

For individuals immediately post cardiac event, this review suggests health-care professionals could benefit from making prompt contact to identify previously active individuals and understand their confidence and motivation to reengage with previous activities. Early communication should highlight the benefits of attending CR such as learning about safe exercise intensity. It should also address concerns about the age appropriateness.<sup>26-28, 32, 34</sup> Promoting personalised goals and providing individually relevant exercise information can enhance motivation for CR engagement and decrease negative outcomes expectancies associated with perceptions of CR exercise exertion levels.<sup>37-39</sup> Whilst individuals may have the necessary existing skills and motivation to support a return to previous exercise behaviour,<sup>40, 41</sup> the synthesis suggests it is unclear if this population have the physical and psychological ability to self-regulate exercise independently, and in accordance with the intensity necessary to improve cardiovascular fitness and reduce secondary prevention risks.

For participants who drop out of exercise-based CR, intentions alone were not sufficient to maintain engagement behaviour.<sup>42, 43</sup> Expectations of improved fitness, understanding exertion levels, individualised exercise support, feedback and exercise monitoring mean that to increase adherence, CR services should regularly review expectations and provide individualised support, including goal setting, problem solving and self-management skills. Whilst our review did find participants completing CR to report improved fitness and the ability to self-manage exertion, we also found participants reporting difficulty in determining CR recommended exercise intensity levels independently of CR.<sup>31</sup> Consistent with previous review recommendations,<sup>41</sup> there is a need for future studies to explore how participants engaging with CR services self-regulate exercise independently and in accordance with CR exercise guidelines.<sup>5, 44</sup>

Across included studies, many participants were labelled according to the number of sessions attended and compared to the pre-determined programme length, for example, completer, non-completer. We found that some previously active participants reported benefit from fewer sessions than the standard programme length.<sup>34</sup> In accordance with CR recommendations<sup>11</sup> and contemporary national clinical guidelines,<sup>5</sup> our findings support the individual assessment of all ACS patients to identify specific exercise behavioural support needs and provide a tailored approach to accommodating these needs. Further, CR exercise communication is found to be a source for self-appraisal of capability. Future research should consider the extent to which the CR exercise information is inflating the perceptions of self and examine the appraisal relationship between this situation and the individual's existing PA intensity levels.

A limitation of this review is the ability to generalise from the findings due to the small number of studies. Study recruitment included a number of geographical locations and a mixture of inpatient and outpatient CR services. The variation within study settings may have implications for how participants responded, limiting the comparability of findings to other settings. In addition, although all papers included data containing experiences and perceptions of participants believing themselves to be previously active, they did not directly assess the review question and may have implications for the review synthesis. The thematic synthesis methodology applied to this review offers a transparent process to the synthesis of the primary studies, however, to avoid over estimation, future research should collect data that both questions and measures how beliefs related to a previous physical activity impact engagement in exercise during CR. Furthermore, future research should consider whether gender influences the strength of the self-perceptions of an exercise identity found in this review.

## Conclusion

In adults diagnosed with ACS, communication post-event and during CR is an important factor in influencing initial and sustained engagement. Additionally, perceptions of an exercise identity and experience of exercise-based CR influence decisions about engagement with CR. To improve uptake and adherence, health professionals need to recognise CR communication not only creates expectations of CR, but also is a source for self-appraisal. Health professionals should tailor information to consider this. Decisions about CR engagement are influenced by previous PA levels, which should be considered in the provision of interventions to optimise PA post-event.

## Conflict of Interest

The authors declare that there is no conflict of interest.

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## Supplementary File 1: Indicative quotes for each theme

Theme	Sub theme	Quotation	Reference
Communication Factors	Expectations of cardiac rehabilitation	<p><i>“non-attendance groups indicated that the services offered by health professionals did not meet their expectations....”(p.11)</i></p> <p><i>“Nonattenders who had previously led active lives and considered themselves to be fitter than most CR patients wanted a regime that had goals tailored to their level.” (p.3538)</i></p>	<p>(Clark, Barbour, White, &amp; MacIntyre, 2004)</p> <p>(Herber, Smith, White, &amp; Jones, 2017)</p>
	Post-event communication and advice	<p><i>“Non-completers and non-attenders were just as likely as completers to be uncertain about the purpose of the programme.”(p.3536)</i></p> <p><i>“I don’t know what they do there, well, somebody said they do exercises.” (p.89)</i></p>	<p>(Herber, Smith, White, &amp; Jones, 2017)</p> <p>(Cooper, Jackson, Weinman, &amp; Horne, 2005)</p>
	Motivators for exercise	<p><i>“I’ve just done it for so many years, it’s just my regular routine”. (p.341)</i></p>	<p>(Cleary, LaPier, &amp; Rippee, 2015)</p> <p>(Hird, Upton, &amp; Chesson, 2004)</p>

Self-perceptions of an exercise identity		<p><i>"I normally walk five miles a day. I want to get back to that level."(p.127)</i></p> <p><i>"... I think it will be useful to get back to exercising to know how much to do" (p.127)</i></p>	
	Self-confidence in physical ability	<p><i>"Coming to the exercise programme has made me confident enough to walk on my own on hills again now." (p.699)</i></p> <p><i>"I think it's good for those who don't know that much, but me, I know what I should and shouldn't do"(p.431)</i></p>	<p>(Robertson, Sheikh, &amp; Moore, 2010)</p> <p>(Shaw et al., 2012)</p>
	Exercise self-reliance	<p><i>"I thought I could do better myself in a sense. I mean I've got an exercise bike, lots of work to do. ...." (p.3536)</i></p> <p><i>"I never understood why it was so important to attend exercise-based CR. Then I thought that I can do it myself instead...."</i></p>	<p>(Herber et al., 2017)</p> <p>(Bäck, Öberg, &amp; Krevers, 2017)</p>
	Perceptions of severity of cardiac condition	<p><i>"some other non-attenders and non-completers felt that exercise intensity and duration were set far lower than their current level of physical fitness and so would be of little benefit. Such</i></p>	<p>(Herber et al., 2017)</p> <p>(Clark et al., 2004)</p>

		<p><i>respondents often believed they have had a 'mild heart attack' less serious than other cardiac patients." (p.3535)</i></p> <p><i>"I was doing more exercise outside than I was doing (at cardiac rehabilitation). It was alright for the likes of those that had a heart operation, I didn't have a big operation. I could see the purpose of THEM carrying on with it, but it wasn't doing me any good, so I didn't go back"(p.10)</i></p>	
	Perceptions of 'fitness identity'	<p><i>"It's absolutely crazy. No disregard to you, but if you've been a fit man, you're in there doing exercises they're giving you as rehabilitation. Absolutely laughable" (p.10)</i></p> <p><i>"Because I was fit or back on the road within a week or back doing normal things within the week I didn't see the need for it [cardiac rehabilitation]"(p.3535)</i></p>	<p>(Clark et al., 2004)</p> <p>(Herber et al., 2017)</p>
	Age appropriateness	<p><i>"I think I went [to the CR exercise clinic] once. They're 80 and I'm 50 and I've got the same problem. I didn't last long doing it."(p.1654)</i></p>	<p>(Dale et al., 2015)</p> <p>(Jones, Jolly, Raftery, Lip, &amp; Greenfield, 2007)</p>

Experience of exercise-based cardiac rehabilitation	of cardiac rehabilitation	<p><i>"I walk a huge 90,000 square foot building [at work], walking around [and] around. "Oh, that's not good enough, you've got to go to your walking exercises." I'm panting, huffing and puffing [at work]. I'm not an 80 year-old who sits on the bench at home and rocks the chair and watches TV." (p.1654)</i></p> <p><i>"Found home exercises too easy and aimed at older age group"(p.346)</i></p>	
	Appropriateness of cardiac rehabilitation exercise	<p><i>"well as I say I play golf [twice per week] and I do a lot of walking, I consider that exercise"(p.353)</i></p> <p><i>"Exercise was considered as a part of the occupation by informants with a physically demanding job and they did not believe that further exercise in their leisure time was necessary."(p.4)</i></p> <p><i>"they said about an exercise class but I was doing enough so I didn't go..." (p.432)</i></p>	<p>(Jones et al., 2007)</p> <p>(Bäck et al., 2017)</p> <p>(Shaw et al., 2012)</p>

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